03684

NORTH EAST TN14

INSTRUCTION MANUAL
FOR
MODEL TN14
COMBINATION TEST LINES

ISSUE 2

northeast electronics
DIVISION OF tau-tron inc.
A UNIT OF GENERAL SIGNAL
Regional Drive
P.O. Box 2021
Concord, NH 03301

PRINTED IN USA

AUG 1969

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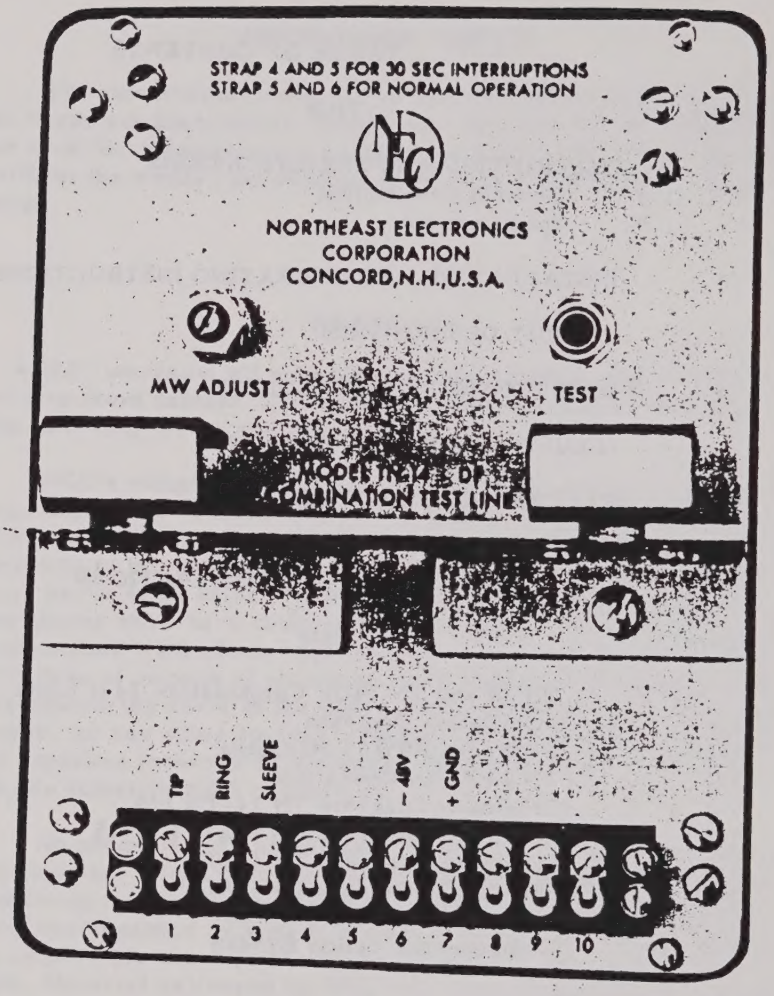

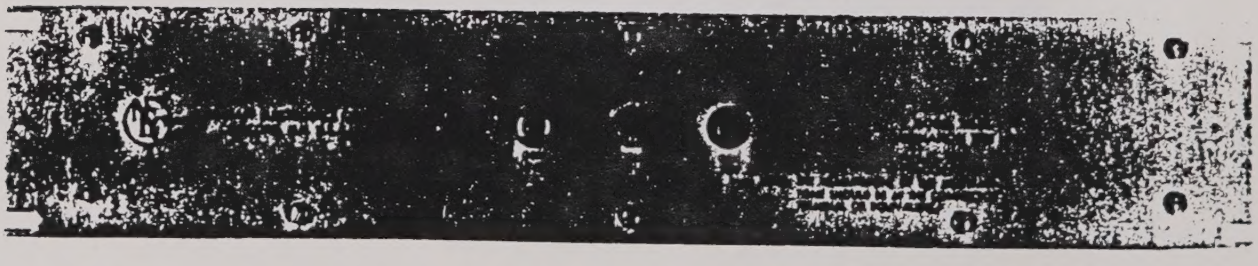

TN 14 and TN 14DF Combination Test Lines

SECTION 1

DESCRIPTION & SPECIFICATIONS

1.1 GENERAL DESCRIPTION

1.2 The TN 14-type Combination Test Line requires but a single test line code number assignment to provide access to both 1000 Hz milliwatt testing power and a balance termination in sequence. This allows both a one-way transmission loss measurement and a noise measurement with a single test call. This reduces the testing time for such calls and is valuable for connection appraisal surveys.

1.3 When noise measurements are made, the tester is assured that the connection has reached the balance termination and is not "high and dry" instead. This is due to the audible and measureable 1000 Hz milliwatt just prior to the balance termination. This allows noise measurements over the same switched connection as that used for the transmission measurement.

1.4 The different versions of the Combination Test Line are as follows:

TN 14 Combination Test Line - with internal MW supply, for relay rack mounting.

TN 14A Combination Test Line - without internal MW supply, for relay rack mounting.

TN 14DF Combination Test Line - with internal MW supply, for distributing frame mounting.

TN 14ADF Combination Test Line - without internal MW supply, for distributing frame mounting.

1.5 The Combination Test Line is a transistorized unit which provides a 1000 Hz milliwatt testing power (internal or external) for 5.5 seconds, after which a 900Ω +2μF balance termination is applied until the connection is released. An internal timing circuit provides a delay of 175 ms after seizure before the milliwatt is applied, and an on hook interruption approximately 11 seconds after seizure. It is compatible with certain types of automatic transmission measuring systems such as the NEC TTS 41SAU-4 DDD Service Analyzer Unit.

1.6 The unit is connected to the tip, ring and sleeve terminals of a vacant subscriber's terminal. When a connection is establishes to the unit, an inductor trips the ringing, presents an off hook condition on the line and the timing circuits are started. Approximately 175 ms after seizure the milliwatt supply is connected to the line and remains for approximately 5.5 seconds. After the milliwatt tone is removed, a balance termination of 900Ω + 2μF is connected to the line and remains until released by the calling party.

1.7 Approximately 5.5 seconds after the connection of the balance termination, the inductor is removed from the line for one second, presenting an on hook condition. The inductor is then returned and remains across the line until released by the calling party.

1.8 A strapping option is provided for offices which require an on hook from the called party in order to release. In this case, however, the above sequence is identical except that during the balance termination the inductor is removed from the line for one second each 30 seconds after the initial off hook interruption.

1.9 SPECIFICATIONS

REFERENCE TONE GENERATOR
(TN 14 and TN 14DF only)

Frequency: 1000 Hz ±1% - Other frequencies between 200 Hz and 5000 Hz can be supplied on request.

Output: 1 MW

Accuracy: ±0.05 dB

Output Level Range: +2 dBm to -1 dBm

Output Impedance: 900Ω (600Ω can be supplied on request)

BALANCE TERMINATION

Impedance: 900Ω + 2μF (600Ω +2μF can be supplied on request)

POWER REQUIREMENTS

Voltage: 48V dc

Approximate current: 100 mA

MECHANICAL

TN 14 and TN 14A: 3½"h x 10"d x 19"w (adapters for 23" bays are available on request)

TN 14DF and TN 14ADF: 6"x8"x8"

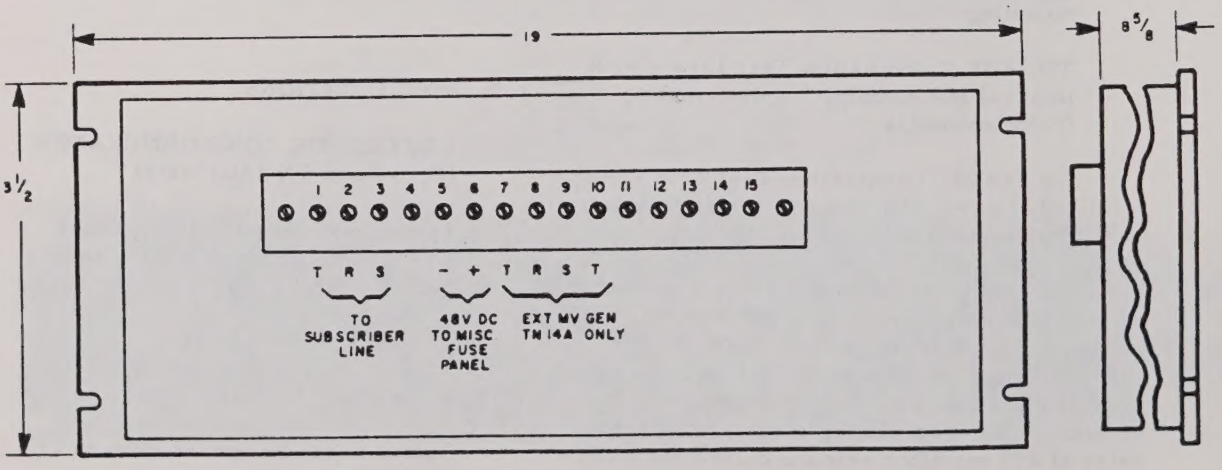

Fig. 2-1 Installation Diagram

SECTION 2

INSTALLATION & OPERATING INSTRUCTIONS

2.1 The TN 14 or TN 14A unit is mounted on a 19" relay rack panel. This panel occupies a rack space of 3½". All connections are made to a single terminal board, which is located on the rear of the panel. Three terminals of this board are connected to the T-R-S leads. Two terminals are connected to ground and negative 48V. All terminals are numbered and the proper connections are shown on the installation drawing.

2.2 If an external milliwatt source is to be used (TN 14A), it is connected to the terminals designated MW GEN and MW START.

2.3 The TN 14 and TN 14A units as shipped from the factory are equipped with an inductor which remains across the line at all times except for a 1 second on hook at the end of the first 11 seconds. For those offices requiring an on hook from the called party in order to release the line, the circuit board must be changed to obtain on-hook interuptions every 30 seconds:

a. Remove screws from rear panel to enable panel to hinge downward.

b. Locate three small pin terminals on rear of printed circuit board E952-07. See Fig. 2-2

c. Remove strap A-C and add strap B-C.

2.4 a. After unit is mounted in relay rack, connect -48V and ground to terminals 5 and 6.

b. If external milliwatt is required, connect to terminals 7 and 8. The MW START lead is provided on terminal 9.

c. Connect the tip, ring and sleeve of the subscriber number to terminals 1, 2 and 3 respectively. (NOTE: The line circuit equipment of the subscriber's number must be disconnected.)

d. Operate TEST NORMAL switch to TEST. Adjust output to desired level by use of the GEN LEVEL control.

NOTE: At least 20 minutes warm-up should be allowed before adjusting milliwatt level.

e. Restore TEST NORMAL switch to normal. Unit is now ready for operation.

1. REMOVE STRAP A-C AND ADD STRAP B-C FOR ON HOOK INTERUPTIONS EACH 30 SECONDS

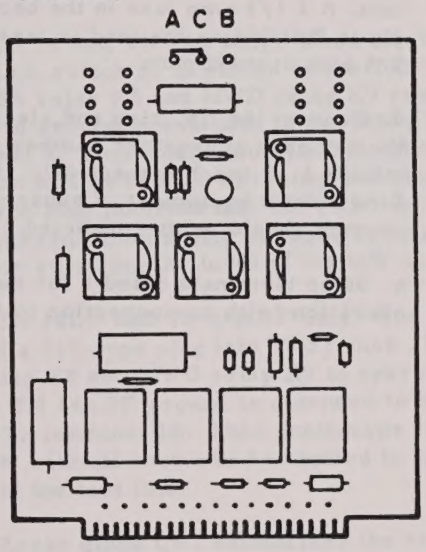

Fig. 2-2 PC Board E95207 Strapping

2.5 TN 14DF and TN 14ADF

2.6 a. Loosen two screws on mounting brackets.

b. Locate the unit at a convenient place on the horizontal frame member; tighten two screws to secure unit.

c. Connect -48V and ground to terminals 6 and 7 respectively, as marked on unit. A 1 1/3 amp fuse in the battery supply is suitable as the load is less than 0.4 amp at maximum.

d. Connect the tip, ring and sleeve of the assigned subscriber number to terminals 1, 2 and 3 respectively. (NOTE: Line circuit equipment of subscriber number should be disconnected.)

e. Strap terminals 5 and 6 for normal operation (with no connection to 4).

Strap terminals 4 and 5 if a called party on-hook is required for release of the connection.

f. Insert a dummy 310-type plug into the TEST jack to start the milliwatt supply. Adjust the output to the desired level by use of the MW ADJUST control.

NOTE: At least 20 minutes warm-up should be allowed before adjusting the milliwatt level.

g. Remove the dummy plug from the TEST jack and the unit is ready for operation.

SECTION 3

CIRCUIT DESCRIPTION

3.1 The circuit schematics for the various models of the TN 14-type Combination Test Line are shown on Figures 5-1 through 5-4. Figures 6-1 through 6-3 show electronic component locations. Figure 3-1 is a sequential flow chart of the relay operations and the circuit arrangements which they set up.

3.2 In the case of the models TN 14DF and TN 14ADF Test Lines an idle circuit termination is across the tip and ring terminals initially. On seizure of the test line the SR relay, K8, is operated and 175 ms later the MWD relay K9 is operated. This latter relay removes the idle circuit termination and as an idle circuit termination it remains removed until the test line is released. However, the same components, resistor R7 and capacitor C2, are used as a balance termination across the tip and ring after the sending period for the 1000 Hz milliwatt.

3.3 In the case of all models, seizure of the test line causes the SR relay, K8, to operate. This sets up a series of events as shown on the flow chart. This may be summarized as follows:

a. Off hook 5.5 seconds sending 1000 Hz milliwatt.

b. Off hook 5.5 seconds terminated with balance termination.

c. On hook 1 second with balance termination. With A and C strapped (TN 14 and TN 14A) or 5 and 6 strapped (TN 14DF and TN 14ADF) off hook with balance termination until test line is released at calling end OR

d. With B and C strapped (TN 14 and TN 14A) or 4 and 5 strapped (TN 14DF and TN 14ADF) cycles of 30 seconds off hook with balance termination and 1 second on hook with balance termination until the line is released at the calling end. Then the test line disconnects at the next on hook period if there is called party supervision. If this first on hook is undesireable for the case where A and C are strapped (TN 14 and TN 14A), then terminals 10 and 11 on pc board E95207 should be strapped.

3.4 TN 14 and TN 14A only. When the TEST NORMAL switch S1 is placed in the TEST position, SR relay K8 and MWD relay K9 are operated and ground is extended to the MW START, terminal 9. Then continuous 1000 Hz MW with off hook will be applied to the tip and ring of a 310-type plug inserted into the TEST jack J1. Thus measurements may be made at this jack for adjusting the level of the MW supply.

3.5 TN 14DF and TN 14ADF only. The insertion of a 310-type plug into TEST jack J1 causes SR relay K8 and MWD relay K9 to operate, and in the TN 14ADF ground is extended to the MW START, terminal 10. Then continuous 1000 Hz MW with off hook will be applied to tip and ring of the test line.

3.6 Zener diode CR7 establishes the voltage reference for the timing circuit transistor. Diode CR6 provides reverse voltage protection. All other diodes provide circuit isolation and coil suppression for the relays, as required.

3.7 PC board E95414 (M5003) is a precision level milliwatt generator capable of sending signals of 300 Hz to 20 kHz. The unit consists of a power supply, oscillator, output transformer, detector and AGC circuit. A schematic diagram of the unit is shown in Fig. 5-2. The component layout is shown in Fig. 6-2.

3.8 The power supply makes use of a 1N823 zener diode (CR903) as its reference element which provides a stable dc voltage. The regulator consists of IC901, a dc amplifier, and the series pass transistor, Q901. The high open loop gain of IC901 provides excellent regulation and ripple rejection. Resistors

R906, R907 and diode CR904 make up the self-starting circuit of the power supply.

3.9 The oscillator consists of the oscillator-amplifier, IC902. Capacitors C905, C906, and resistors R913, R917 and R918 make up the frequency determining components of the Wein bridge. The specified values are for approximately 300 Hz; to change frequency, resistors R912 and R913 are provided as selected values. As these resistors are decreased in value, the frequency will increase. Resistors R912 and R913 should be within 2% of each other. The frequency can also be changed externally by putting resistors from pin 7 to pin 9 and from pin 9 to pin 22. Capacitors C905 and C906 will be 0.01μF for frequencies of 300 Hz to 5 kHz and 0.001μF for frequencies of 5 kHz to 20 kHz. Resistors R910, R911 and C904 make up the positive feedback bridge arm, the negative feedback is provided by resistors R915 and R916.

3.10 The output impedance is 900Ω. By strapping pins 2 and 10, the impedance can be changed to 600Ω. One-half of the transformer primary is used as a level sense winding. Resistor R924 is the load for the sense winding.

3.11 The detector consists of an ac amplifier, bridge and a dc amplifier. Resistors R927 and R928 are the gain determining resistors. The gain can also be determined by external resistors placed across pins 12 and 11 and pins 11 and 14. As these resistors increase, the output level increases. The ac amplifier is made up of transistors Q903, Q904. Transistors Q904 and resistor R931 are bootstrapping elements. The bridge consists of diodes CR907, CR908, capacitors C915 and C916. Resistor R933 is the feedback resistor of the detector. IC903 is the dc amplifier; transistor Q902 is used as the AGC element.

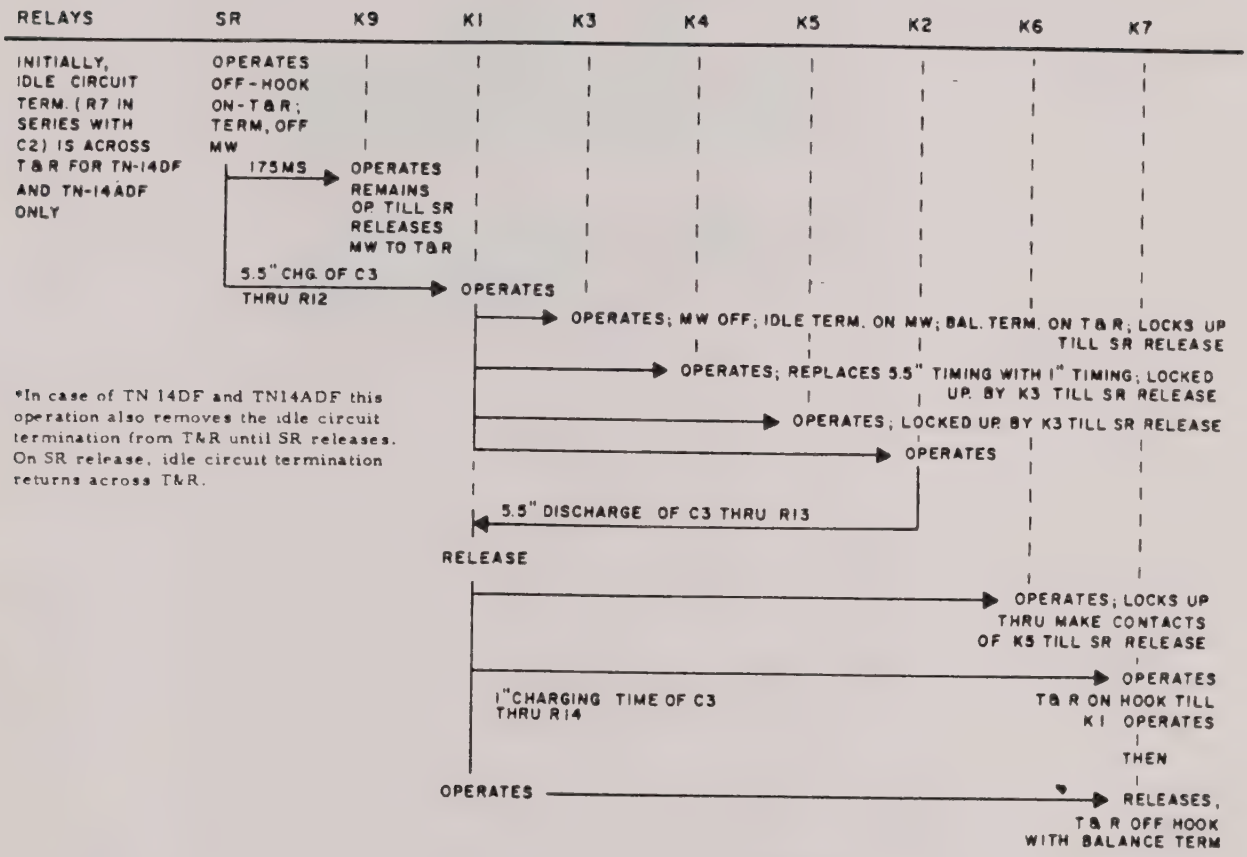
RELAYS
SR
K9
K1
K3
K4
K5
K2
K6
K7
INITIALLY, IDLE CIRCUIT TERM. (R7 IN SERIES WITH C2) IS ACROSS T&R FOR TN-14DF AND TN-14ADF ONLY
OPERATES OFF-HOOK ON-T&R; TERM, OFF MW
175MS
OPERATES REMAINS OP TILL SR RELEASES MW TO T&R
5.5" CHG OF C3 THRU R12
OPERATES
OPERATES; MW OFF; IDLE TERM. ON MW; BAL. TERM. ON T&R; LOCKS UP TILL SR RELEASE
OPERATES; REPLACES 5.5" TIMING WITH 1" TIMING; LOCKED UP BY K3 TILL SR RELEASE
OPERATES; LOCKED UP BY K3 TILL SR RELEASE
OPERATES
*In case of TN 14DF and TN14ADF this operation also removes the idle circuit termination from T&R until SR releases. On SR release, idle circuit termination returns across T&R.
5.5" DISCHARGE OF C3 THRU R13
RELEASE
OPERATES; LOCKS UP THRU MAKE CONTACTS OF K5 TILL SR RELEASE
OPERATES T&R ON HOOK TILL K1 OPERATES
1"CHARGING TIME OF C3 THRU R14
THEN
OPERATES
RELEASES, T&R OFF HOOK WITH BALANCE TERM

Fig. 3-1 TN 14 Relay Operation

TN 14 & TN 14A

If "A" is connected to "C": -48V thru R15 holds C3 charged and circuit remains off hook with balance termination until SR releases. This is normal operation.

If "B" is connected to "C": Cycles are introduced of 30" off hook with balance termination under control of K1 & K2, timed by discharge of C3 thru R15; then 1" on hook under control of K4 & K7. This is optional operation where called party supervision is required.

TN 14DF
TN 14ADF

As above for TN 14 and TN 14A except that terminals 5 and 6 are strapped for normal operation, or 4 and 5 are strapped where called party supervision is required.

SECTION 4

MAINTENANCE INSTRUCTIONS

4.1 MAINTENANCE. There are no maintenance procedures for the Combination Test Line. Should a malfunction occur, standard fault procedures should be performed by qualified personnel.

4.2 Should malfunction occur within the Milliwatt Generator circuit of the Combination Test Line, servicing should be carried out only by qualified personnel experienced in trouble-shooting of solid state circuits.

SECTION 5

ILLUSTRATIONS AND DRAWINGS

The following pages contain the schematic diagram for the Model TN 14 Combination Test Line.

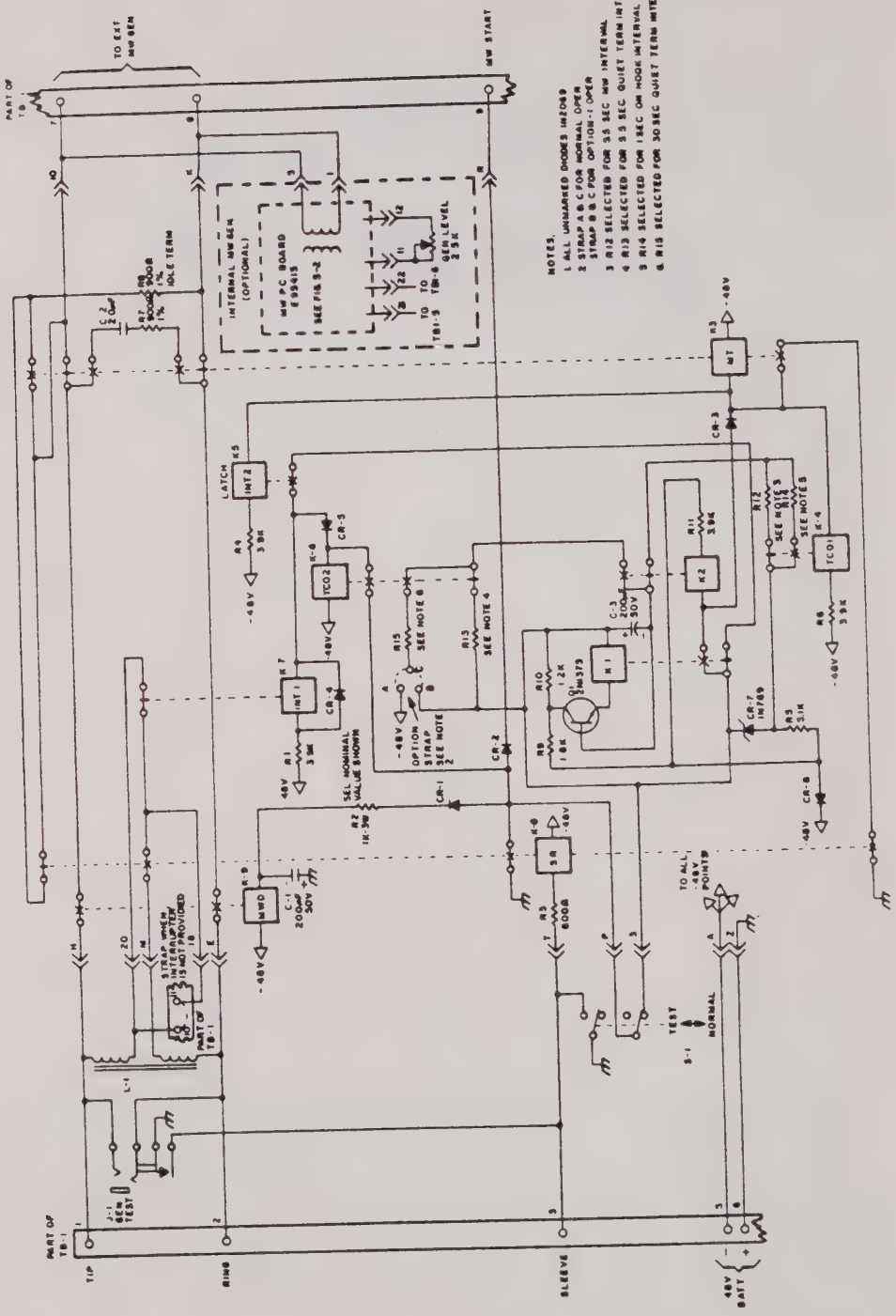

Fig. 5-1 Schematic Diagram TN 14-TN 14A

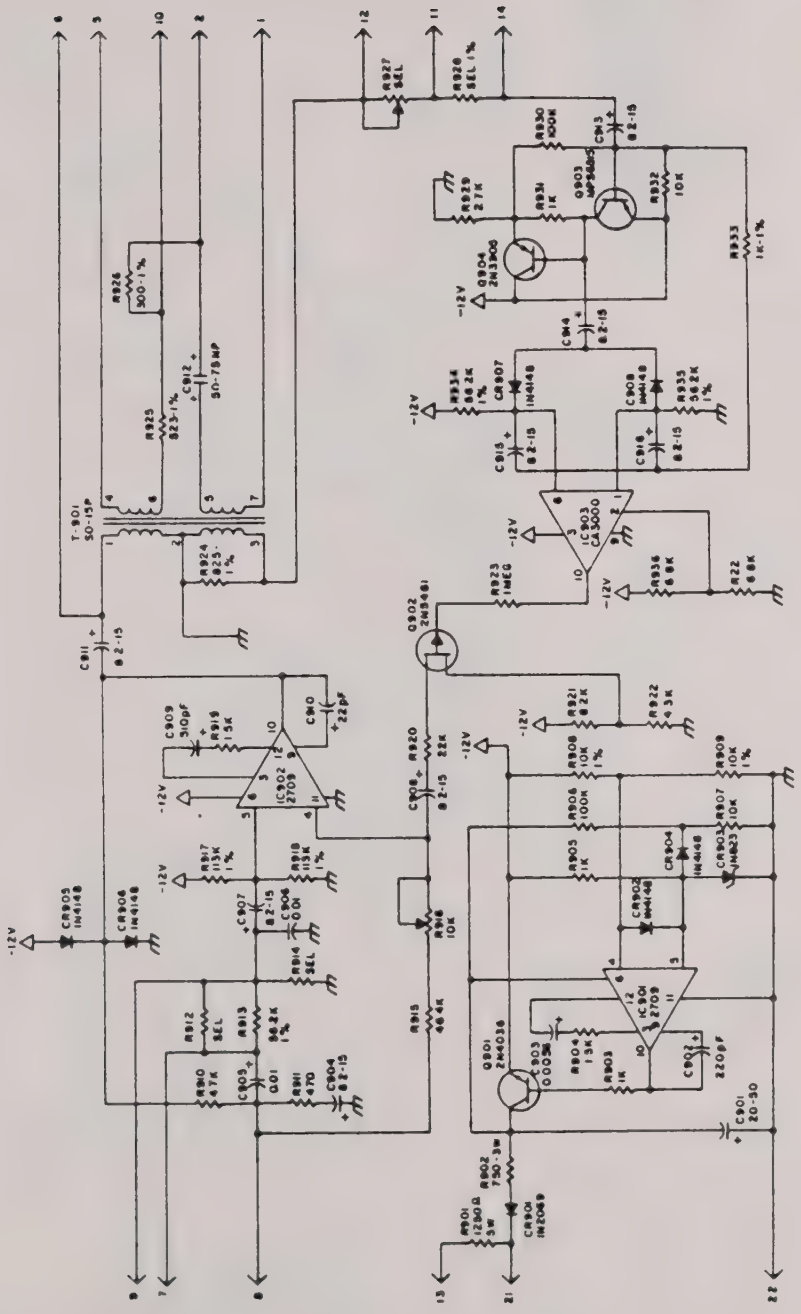

Fig. 5-2 Schematic Diagram PC Board E95415

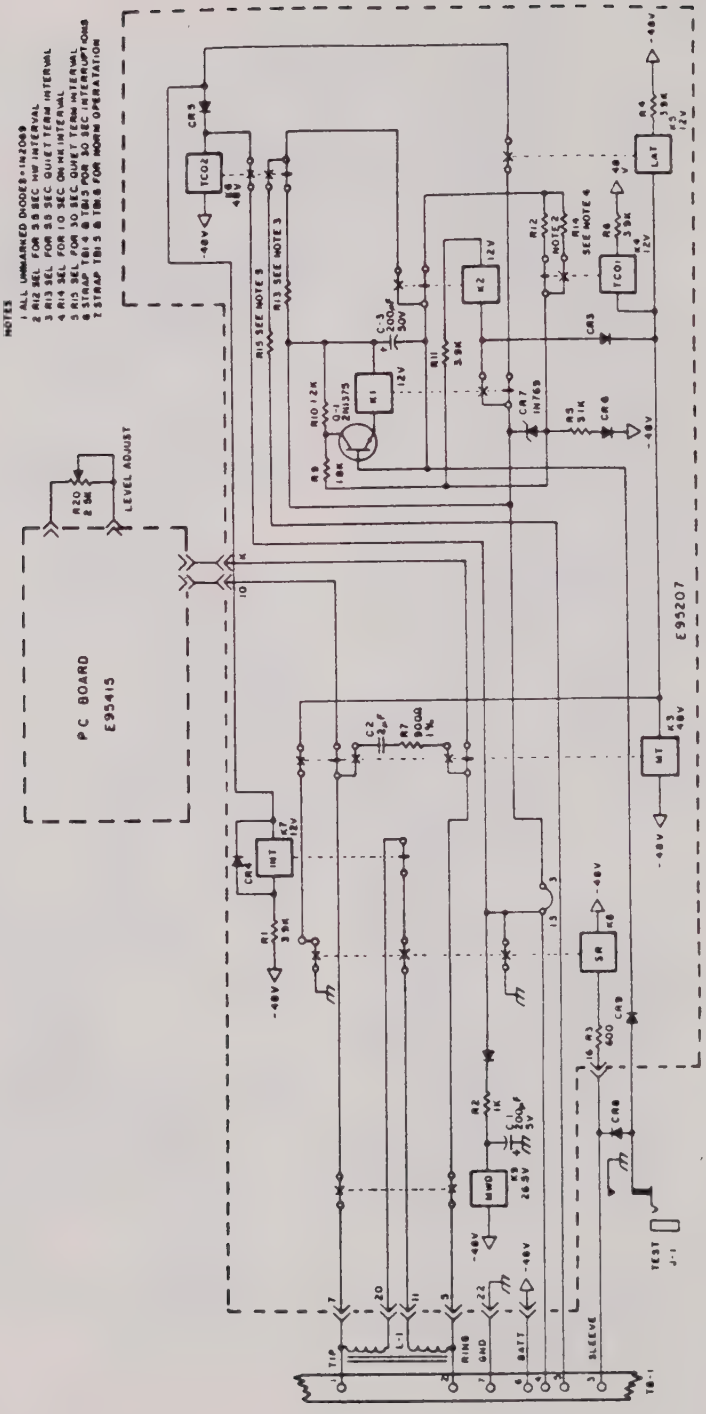

Fig. 5-3 Schematic Diagram TN 14DF

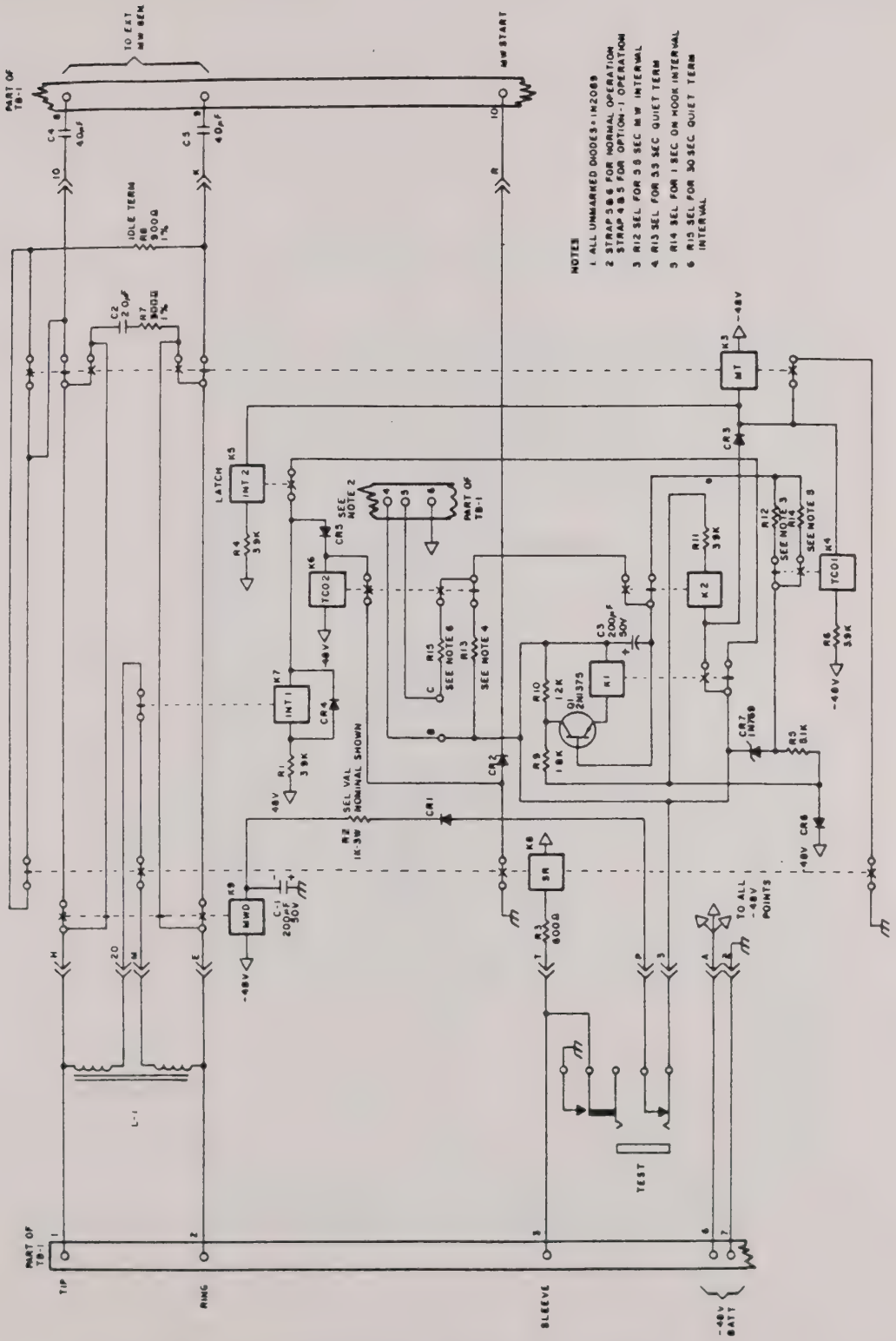

Fig. 5-4 Schematic Diagram TN 14ADF

SECTION 6

ELECTRONIC PARTS LIST

6.1 INTRODUCTION. The following pages contain the parts list for the Combination Test Line.

6.2 FSCM Code Numbers. A list of manufacturers and their respective code numbers is given below.

LIST OF MANUFACTURERS

Code No.	Company
01121	Allen Bradley
04009	Arrow-Hart & Hegeman
04221	Aemco
06819	NEC
07716	IRC
09353	IEI
09357	C&K
12065	Transitron
12697	Clarostat
13606	Sprague
49671	RCA
77342	Potter & Brumfield
80368	Sylvania
78277	Sigma
81095	Triad
82389	Switchcraft
84171	Arco

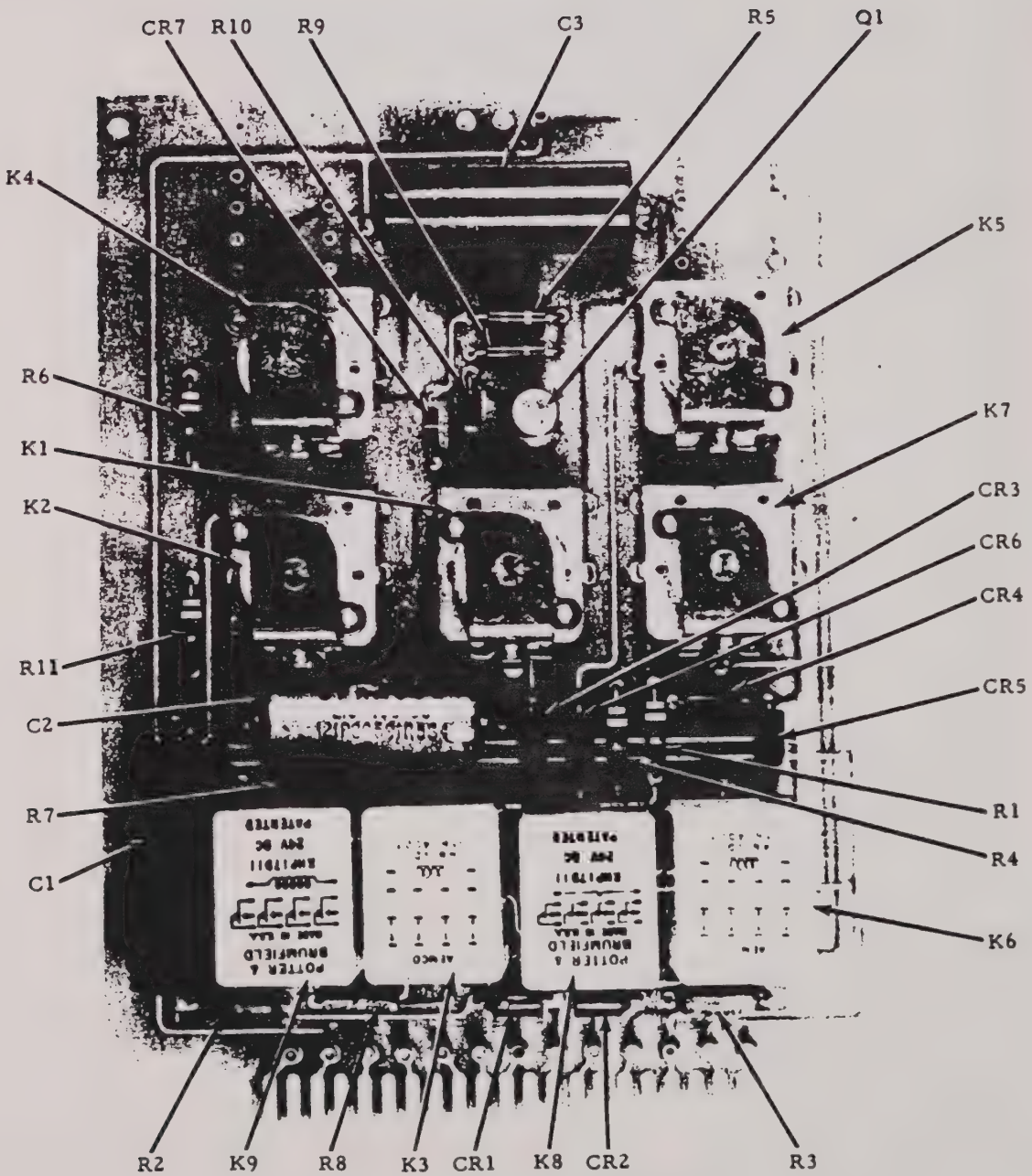

Fig. 6-1 Component Location E95207

PC Board E95207

Ref Desig.	Description	Manufacturer (FSCM Code #)	Part Number
C1	C: 200μF 50V electrolytic	09353	FPA-200J-D
C2	C: 2.0μF 50V paper	13606	121P5091R5S4
C3	C: 200μF 50V electrolytic	09353	FPA-200J-D
R1	R: 3.9K ±10% ½W composition	01121	
R2	R: 1K ±5% 3W wirewound	13606	242E
R3	R: 600Ω ±5% 3W composition	13606	
R4	R: 3.9K ±10% ½W composition	01121	
R5	R: 5.1K ±10% ½W composition	01121	
R6	R: 3.9K ±10% ½W composition	01121	
R7 and R8	R: 900Ω ±1% ½W metal film	07716	CEATO
R9	R: 1.8K ±10% ½W composition	01121	
R10	R: 1.2K ±5% ½W composition	01121	
R11	R: 3.9K ±10% ½W composition	01121	
R12 thru R15	R: sel val	01121	
K1 and K2	Relay: 12V coil 1C	78277	65FP1A
K3	Relay: 48V coil 4C	04221	156-4023
K4 and K5	Relay: 12V coil 1C	78277	65FP1A
K6	Relay: 48V coil 4C	04221	156-4023
K7	Relay: 12V coil 1C	78277	65FP1A
K8 and K9	Relay: 24V coil 4C	77342	KHP17D11
CR1 thru 6	Diodes	80368	1N2069
CR7	Diode: zener 9V	12065	1N769

Main Assembly

L1	Hold coil	06819	TN1274
S1	S: (TN14 and TN14A only)	04009	81027-CH
J1	Jack	82389	C55B-SF
Q1	Transistor	01295	1N1375

E95415 Milliwatt Generator

Ref Desig.	Description	Manufacturer (FSCM Code #)	Part Number
R901	R: 1.25K ±5% 5W wirewound	12697	VC5E
R902	R: 750Ω ±5% 3W wirewound	44655	4418
R903	R: 1K ±5% ½W carbon	01121	
R904	R: 1.5K ±10% ½W	01121	
R905	R: 1K ±5% ½W	01121	
R906	R: 100K ±5% ½W	01121	
R907	R: 10K ±5% ½W	01121	
R908, R909	R: 10K ±1% 1/8W	07716	CEATO
R910	R: 4.7K ±5% ½W	01121	
R911	R: 470Ω ±5% ½W	01121	
R912	R: sel val	07716	CEATO
R913	R: 56.2K ±1% 1/8W	07716	CEATO
R914	R: sel val	07716	CEATO
R915	R: 46.4K ±1% 1/8W	07716	CEATO
R916	R: 10K ±20% ¼W pot	71450	UPE-200RE-1
R917, R918	R: 113K ±1% 1/8W	07716	CEATO
R919	R: 1.5K ±10% ½W	01121	
R920	R: 22K ±5% ½W	01121	
R921	R: 8.2K ±5% ½W	01121	
R922	R: 4.3K ±5% ½W	01121	
R923	R: 1Meg ±10% ½W	01121	
R924	R: 825Ω ±1% 1/8W	07716	CEATO
R925	R: 523Ω ±1% 1/8W	07716	CEATO
R926	R: 300Ω ±1% 1/8W	07716	CEATO
R927	Pot: sel val	71450	UPE-200RE-1
R928	R: sel val	07716	CEATO
R929	R: 2.7K ±5% ½W	01121	
R930	R: 100K ±5% ½W	01121	
R931	R: 1K ±5% ½W	01121	
R932	R: 10K ±5% ½W	01121	
R933	R: 1K ±1% 1/8W	07716	CEATO
R934, R935	R: 56.2K ±1% 1/8W	07716	CEATO
R936, R937	R: 6.8K ±5% ½W	01121	
C901	C: 20μF 50V	13606	TE-1305
C902	C: 220pf 1KV 20%	71590	DD-221
C903	C: 0.0056μF 100V 10%	13606	225P
C904	C: 8.2μF 15V 10%	05397	K8R2W15K
C905, C906	C: 0.01μF 35V 5%	13606	490P1035R35
C907, C908	C: 8.2μF 15V 10%	05397	K8R2W15K
C909	C: 510pf 1K 20%	71590	DD-511
C910	C: 22pf 1K 20%	71590	DD-220
C911	C: 8.2μF 15V 10%	05397	K8R2W15K
C912	C: 50μF 75V	22650	32-500-50-75-8NA
C913-916	C: 8.2μF 15V 10%	05397	K8R2W15K
IC901, 902	Integrated circuits	01295	SN72709N
IC903	Integrated circuit	49671	CA-3000
CR901	Diode: silicon	80368	1N2069
CR902	Diode: silicon	12065	1N4148

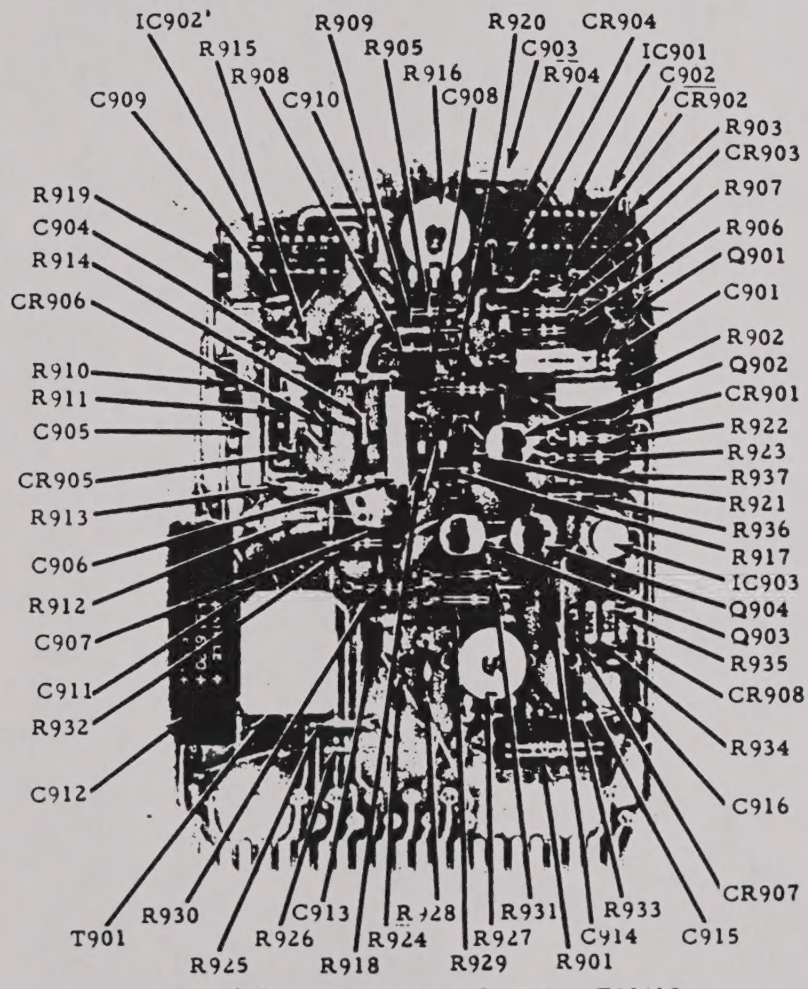

Fig. 6-2 Component Location E95415

Ref Desig.	Description	Manufacturer (FSCM Code #)	Part Number
CR903	Diode: zener	15873	1N823
CR904-908	Diodes: silicon	12065	1N4148
Q901	Transistor	49671	2N4036
Q902	Transistor	15873	MPF152
Q903	Transistor	15873	MPS6515
Q904	Transistor	15873	2N3905
T901	Output Transformer	80223	S0-15P
	Heat Sink	81483	DD-121C

ACCOPRESS®

25970	YELLOW
25971	BLACK
25972	LIGHT BLUE
25973	DARK BLUE
25974	LIGHT GRAY
25975	LIGHT GREEN
25976	DARK GREEN
25977	TANGERINE
25978	RED
25979	EXECUTIVE RED

GENUINE PRESSBOARD

ACCO USA, INC.
770 S. ACCO PLAZA
WHEELING, IL 60090

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